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method of sporulation, or multiple reproduction, which takes place within a cyst formed by the animal itself. This cyst is thick-walled, spherical, and transparent, and, although without stalk or adhesive organ of any sort, it regularly sticks fast to small objects in the water, being found singly or in groups on sticks or stones. The series of changes were not observed in full, but the nucleus of the amœba is reduced by a series of direct divisions into a large number of daughter-nuclei. When this number has reached some five or six hundred the body of the amœba divides into as many independent daughter-individuals, and these are set free by the gradual decay and bursting of the cyst wall. A flagellate stage does not occur in *Amœba proteus*, but the spores enter directly upon the amœboid condition.

The causes of the multiple division in the encysted condition were not determined. The process is not related to sexual reproduction and apparently does not occur at regular intervals. Experiments by starvation, excess of food, evaporation of the water, and by transferring the animals to water from other localities, *i.e.*, by changed conditions of existence to bring the amœbas to encystment and sporulation, were uniformly without success. H. B. W.

**Arctic Deep-Sea Fauna.** — One of the most important results of recent Arctic exploration is the discovery of a true deep-sea fauna. An address delivered recently to the German Zoölogical Society by Dr. Schaudinn,<sup>1</sup> on the expedition made in 1898 by Drs. F. Schaudinn and F. Roemer to Spitzbergen, contains a preliminary report on this fauna.

This expedition set out to make collections in the Spitzbergen Sea, and successfully tried to reach the deep Arctic basin discovered by Nansen. This deep, called by Schaudinn the "Nansen Rinne," was reached north of Spitzbergen in  $81^{\circ} 32'$ , and a number of deep-sea dredgings were made. A true deep-sea fauna was discovered entirely different from the Arctic fauna of the shallow sea surrounding Spitzbergen (and from the other Arctic faunas hitherto known). Its most striking feature is the presence of an abundance of Hexactinellid sponges, a group never found previously in the Arctic regions, all of them belonging to new genera. These sponges are so plentiful that their remains form a very characteristic deposit on the bottom, composed of the spicules of the dead sponges closely connected and densely interwoven, so as to form a fine network, the meshes of

<sup>1</sup> Schaudinn, F. *Verh. Deutsch. Zool. Gesellsch.* (1899), pp. 227 ff.

which are filled with mud ; after washing out the mud, about one-third of the volume remains as a glittering mass ("Glaswolle").

A detailed report on the peculiarities of this deep-sea fauna will be given in a separate work entitled *Fauna Arctica*, and will be, no doubt, one of the most interesting additions to our knowledge of the Arctic faunas.

A. E. O.

**Arctic Marine Animals.** — The material collected by the Princeton Expedition to North Greenland in 1899 has been sorted out, and part of it has been identified. It proves to be the largest collection of Arctic marine life ever made in the neighborhood of Inglefield Gulf and Smith Sound. Of the animals reported by former expeditions (Hayes, Nares, Peary Expedition of 1894), nearly every species is represented in the collection, while many additional species were taken which have not yet been recorded from these parts.

The chief value of this collection lies on the zoögeographical side, adding new localities to the known range of Arctic forms from parts hitherto almost unknown. These localities, situated so far north ( $76-79^{\circ}$ ), will be very valuable in the construction of a connection between many species now known from the Atlantic and Pacific parts of the Arctic seas. Some species seem to be truly circumpolar in distribution, while in others the connection seems to be interrupted. For the establishment of such cases an investigation of the fauna of this region as well as that of the northern coast of Siberia is necessary, and the collections of the Princeton Expedition to North Greenland, when published, will, in this respect, add considerably to our knowledge.

A. E. O.

**Notes.** — Dr. Thiele reports in *Fauna Arctica* a new solenogaster, *Proneomenia thulensis*, found by the German Arctic Expedition of 1898. It is characterized by a radula with many small teeth and by a multifid receptaculum.

In the Munich *Sitzungsberichte* Mr. A. M. Przesmycki reports his success in staining the nucleus of living *Opalina* and *Nyctotherus* with neutral red. The chromatin elements show the deeper color, and the phases of nuclear division may be watched in the living organism.

Text-books of zoölogy have made the statement that the mouth in the Infusoria is formed by the simple division of the parental organ. In the Heidelberg *Verhandlungen* Dr. A. Schuberg describes the origin of the peristomal region of *Euplotes patella* as a series of